

# The Statistical Approach to Regions\*

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It has been rather generally accepted among American geographers that a region is an area which is homogeneous enough in its physical character to possess either actual or potential unity in its cultural aspects. There are many variants of this definition, but it is obvious that geography has long tended to treat social and physical facts as related phenomena.

While geography has much to offer in the way of systematic or topical analysis, nevertheless, from the very nature of the subject it is patent that the regional concept is its most valuable contribution. Much of the value of regional analysis and exposition, however, hinges upon the nature of the regional unit used and the basis upon which it is delineated.

## BASES FOR REGIONAL DELIMITATION

Areal divisions or "regions" have, in most instances during the past, been delineated on the basis of *physical* considerations, the assumption being that an area demarked by geomorphic, climatic, or edaphic factors, is a unit habitat impelling enough to produce unity in cultural affairs. To a limited extent, this assumption is valid, but it has probably led to many incorrect conclusions in human economy. One may therefore ask, "Can regions be recognized and their boundaries drawn by approaching the matter from the non-physical side?" In other words, can an area's "regionality" be discovered and the region delineated through the measurement of its social data?

The title of this paper suggests that the problem may be so approached. This is postulated upon what may be called two ecological verities, or merely two assumptions, depending upon one's viewpoint. These are:

(a) That the kernel characteristic of a region is that it is an area within which certain types of socio-economic adjustments to the fundement have been made by man so generally as to constitute the real "regionality" of the area, and therefore to provide the reason for separating that area from adjacent areas which are characterized by different types of adjustments to the fundement.

(b) That the visible manifestation of these geographic adjustments is a cultural landscape or combination of landscapes whose outer limits form the boundaries of the region.

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\* The second of three correlated papers contributed to *A Conference on Regions*. (See p. 121).

If these two principles be accepted, it follows that regions may be described and delineated through their cultural attributes. This approach may take two forms.

- (a) Through field study of the cultural landscape.
- (b) Through a statistical analysis of the data which measure the ecological relationships underlying and giving rise to that cultural landscape.

The first named form of approach is undoubtedly preferable, but it is both slow and costly. Moreover, major systems of regions cannot be delineated in this country on such a basis, until there be established a United States Geonomic Survey, or some comparable agency. One is therefore compelled to employ at times what is probably the less desirable method, namely the statistical approach to regional study.<sup>1</sup> This method is, of late, being used quite generally in this country in order to attain certain practical ends.

#### PRESENT NEED FOR THE REGIONAL APPROACH

For many years the historians have recognized and dealt with a certain lack of uniformity in American life and attitudes. For want of a better term they described this vaguely as "sectionalism," in recognition of the principle that neither people nor social conditions are similar throughout the nation. The geographer has been more exact, and has evolved a definite regional viewpoint, but recent events indicate that he has done little to create general habits of regional thinking.

Today, out of the wreckage of economic collapse, there arises a need and a demand for reconstruction based upon national planning. The politician and the economist cannot, however, formulate a uniform program to fit all parts of the country. They have therefore laboriously discovered what the geographer has known all along, and what the historian has vaguely sensed and called sectionalism, and what the sociologist has recognized but misnamed provincialism. In short, as Dr. Donald Davidson puts it, the politician or economist now "uses the words region and regionalism and proceeds to develop a *new* method of studying American life."<sup>2</sup> The result has been the rise of two youthful professional groups: first the city planners, and more recently the regional planners. Simultaneously, but entirely independently, there has been emerging a new school of econo-

<sup>1</sup> The term statistical is here used not in its narrower sense, *viz.*, mathematical computation and analysis, but in its broader meaning—the use of all compiled social data.

<sup>2</sup> Donald Davidson, "Regionalism Versus Sectionalism," *Social Forces*. Oct 1934, pp. 23-31.

mists—the regional and land economists as distinguished from the orthodox institutional economists. Most of these workers have paid little, and some have paid no attention to the regional philosophy established among geographers. The Tennessee Valley, the Colorado Basin, the New England Planning Region and the New York Metropolitan District are examples of new planning units, or so-called regions now in existence. In certain instances, the bases for delimiting these regions are exceedingly tenuous, in others, only moderately so.

#### SOME STATISTICALLY DETERMINED REGIONS

In striking contrast to much of the new regional philosophy and practice, are the regional studies undertaken by some of the Federal Government's research agencies. The results of these latter have been so fruitful generally as to suggest that their method of approach is entirely valid. Accordingly, a few representative examples are here presented.

*Type of Farming Regions.* One of the first attempts to devise a system of agricultural regions of statistical procedure was Dr. O. E. Baker's "Agricultural Regions of North America."<sup>3</sup> This proved so valuable that in 1932 a very much more detailed study was undertaken under the direction of Dr. F. F. Elliott of the Bureau of Agricultural Economics, on "Types of Farming in the United States." By means of this study, it was hoped that a very detailed map of agricultural regions might be constructed. The proximate aim of such a map was to provide an accurate large scale basis of reference for general research work in the Bureau, and thereby to prevent the making of loose generalized statements about agricultural conditions or practices over large areas. The ultimate aim of the map was to supply an areal basis for the Agricultural Outlook program, for Extension projects, and for various Farm Management and Farm Credit studies.<sup>4</sup>

The farm schedule of the 1930 census of agriculture contains five questions regarding value of crops, livestock, animal products, and forest products sold or traded, value of farm products used by the operator's family, and value of receipts from tourists and boarders.<sup>5</sup> The method of handling the data was as follows: Between 300 and 400 census clerks were set to work sorting the individual schedule cards and classifying all farms in the United States into twelve types and five subtypes. These types ranged

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<sup>3</sup> See various issues of *Economic Geography*, Worcester, Mass., 1926 ff. The map of agricultural regions appears in volume 2 (1926), opposite page 459.

<sup>4</sup> F. F. Elliott, "Use of the Type of Farming Material of the 1930 Census," *Jour. of Farm Econ.*, Vol. XV, No. 4, Oct. 1933, 647.

<sup>5</sup> F. F. Elliott, *Types of Farming in the United States*, U. S. Govt. Print. Office, 1933, p. 5.

from Cash Grain or Cotton to Self-Sufficing—the basis for classification being 40 per cent or more of the gross income from any one source.

After securing this breakdown of data into farm income by type-of-farming source, a percentage coefficient was computed for each county of the United States. These were entered upon a large base map so as to reveal the areal distribution of these type-of-farming coefficients. The next step consisted in drawing areal boundaries. In those counties containing large cities, in the large irregular counties of the West and in many of the transition zones between regions, county data proved to be too coarse for use. In these instances card counts by minor civil division instead of by counties were made. With these refinements, very accurate boundaries could be drawn, and some 812 type-of-farming districts were demarked and named. Later it was found possible to group these districts into some 500 subregions, or into about 100 regions, and even into about a dozen major provinces (Fig. 1. This is a highly generalized form of the Elliott map).

*Land-Use Problem Regions.* Another example of regional delineation is furnished by the work of the Land Section of the U. S. National Resources Board. During the summer of 1934, several men from the departments of Agriculture and Interior, including the writer, undertook to collect data on land-use problems in the United States, including the so-called submarginal land problem. From these data, it was intended to construct a map of regions showing land-use maladjustment over the nation. Such a map would group land problems into areal units, and thereby provide the basis for generalizing the social and economic facts regarding these problems.

It was recognized at the outset that the unsatisfactory condition of land uses is to be measured largely in terms of soil, climate, relief and location. These factors therefore should logically be employed as bases for designating those areas which are of low value for the use to which they are now devoted. There are available, however, very limited data expressing the qualities of these factors, and from them it is difficult if not impossible to select the areas of submarginal land use. Hence, to make such a selection it becomes necessary to secure various statistical evidences of the present use and productivity of land, of the relative financial status of the inhabitants, and of their local governments.

In order to secure such data, base maps were sent to the various state planning authorities. On these the consultants were asked to indicate the major land-use problems for each minor civil division in their state, after which the maps were to be returned to Washington, together with substantiating data. The method in recognizing and delineating the several types of problem areas varied considerably from state to state, but alto-

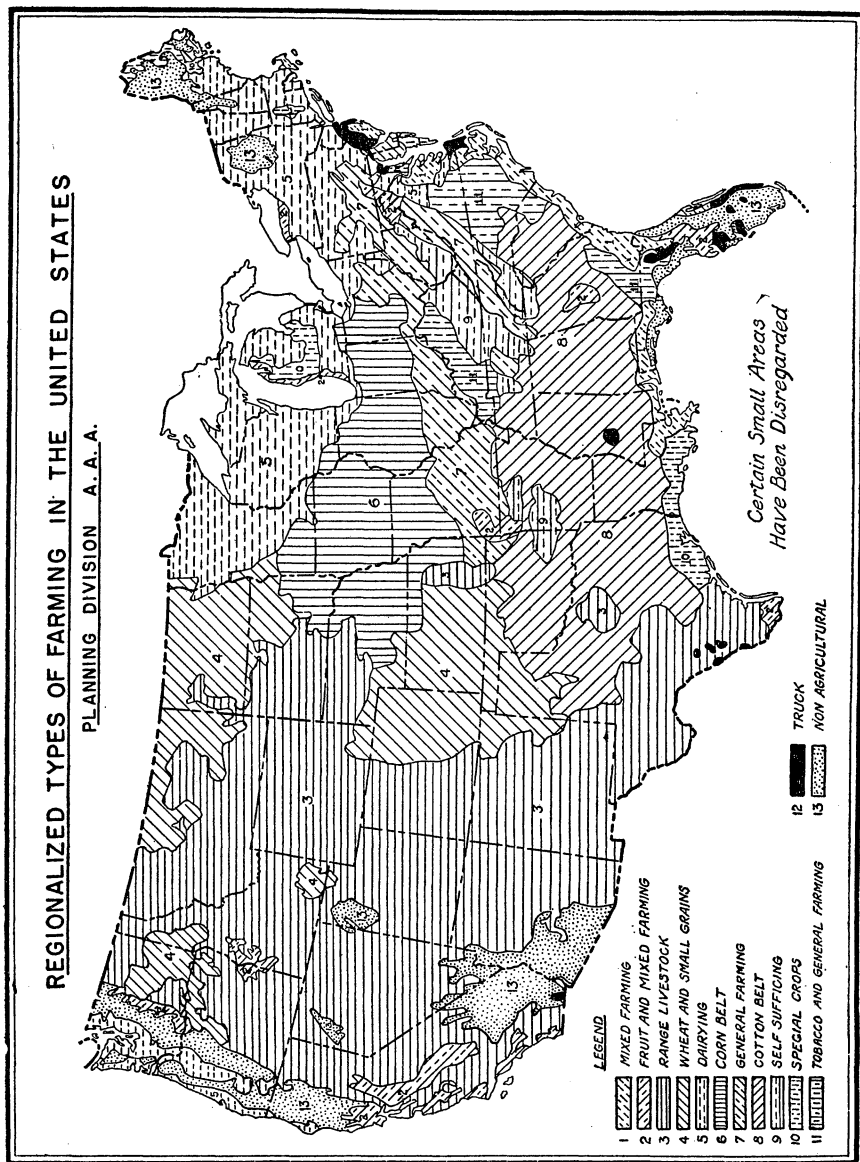


FIG. 1.

gether a vast amount of statistical information was collected and tabulated as evidence of the need for land-use adjustment. When viewed as a whole, the data indicated a very complex situation. The land planning consultant for Indiana has devised an ingenious method for simplifying the picture. He selected eleven of the most significant factors and employed these as indices to measure the value of present land-use in Indiana.<sup>6</sup> For every minor civil division of the State a score card was prepared on which ratings could be made for each of the selected eleven index factors.

Seven of these indices are economic, measuring agricultural use and value; two are social, measuring standard of living; and two are political, measuring the relative success in the support of government. Since these are of unequal value in determining the submarginality of land, they were assigned weights. See Table I.<sup>7</sup>

TABLE I. RHODES'S INDICES FOR INDIANA

	<i>Weight</i>
<i>A. Economic</i> (Measures of Agricultural Use and Value)	
Average value per acre of land in farms .....	15
Percentage of assessed land in crops .....	15
Average assessed value of all land .....	12
Percentage of farmland in unpastured timber .....	9
Percentage of total township area in farms .....	8
Percentage of farmland idle or fallow .....	5
Percentage of farmland in wooded pasture .....	5
<i>B. Social</i> (Measures of Standard of Living)	
Average value of farm real estate per capita .....	15
Average value of dwelling per farm .....	10
<i>C. Political</i> (Measures of Relative Success in Governmental Support)	
Percentage of land tax delinquent, 1928 .....	10
Average State school subvention per capita .....	10
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MAXIMUM TOTAL SCORE .....	114

Data from the Federal Census, from the Department of Farm Management at Purdue University, and from the Indiana State Tax Board were tabulated. All minor civil divisions were then scored on each of the eleven factors, and from these, total township scores were computed. These totals are weighted measurements of the effectiveness of economic, social, and political relationship in each minor civil division. As such, they must be regarded as true coefficients of geographic adjustment. The method of

<sup>6</sup>L. H. Rhodes, "Land Planning Report for the State of Indiana," prepared for the Land Section of the National Resources Board, Oct., 1934.

<sup>7</sup>The map of Indiana on which these data were distributed was shown at the meeting, but it is not available for publication.

scoring permitted a maximum score of 114 points and a minimum of 11 points and brought to light a wide variation among townships. For example, Boone Township of Crawford County was lowest with 22 points and Center Township of Clinton County was highest with 110.

At this point it became necessary to determine what dividing score to use in separating submarginal from supramarginal land. A detailed study was made therefore of three sample poor townships. In all of these it was found that at least 80 per cent of the land was unfit for agriculture, and that the total adjustment scores were less than 40. It was finally decided to use a score of 37 as the upper limit of submarginality. In the end, there were 23 Indiana townships (including all of Brown County) with scores of 37 points or less. With these were included portions of 8 adjacent low-score townships. These were adjudged as definitely submarginal, listed for retirement from farming, and recommended for national forest. In addition, 44 whole townships and parts of 9 townships showed scores of 38 to 50 points. These were listed for partial retirement and recommended for state forest. This constituted the extent of the submarginal land problem in the state. Numerous other townships were classified as needing enlargement of farms in order to permit better agricultural practices, others as demanding erosion control, still others as requiring improved symbiotic relations between farming and forest management, and so forth.

Finally a boundary was drawn around *all* of these problem areas and the state thereby was divided into two major divisions, one the problem portion of southern Indiana, and the other the generally non-problem northern portion. Later, it was decided that the latter formed part of the Central Agricultural Region, whereas the former was an integral part of a larger Ozark-Appalachian Problem Region.

By this or comparable methods all of the states of the United States were divided into problem and non-problem portions. In the problem portions, boundaries were drawn separating definite combinations such as submarginal farming and forest land problems, or erosion and farm size adjustment problems, or submarginal farming, erosion and rangeland problems, and so forth. The end product was a map of the United States showing general regions of geographic maladjustment of considerable use in national planning (Fig. 2).<sup>8</sup>

*Value of Results.* From these examples it may be seen that regions are being and have been delineated by statistical methods. The results have been such as to suggest that, in general, this is a valid method of

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<sup>8</sup> This map, without the "Key to Land Use Problems" was published in the National Resources Board: *Report on National Planning and Public Works, December 1, 1934*, p. 156. Washington: Govt. Ptg. Office, 1934

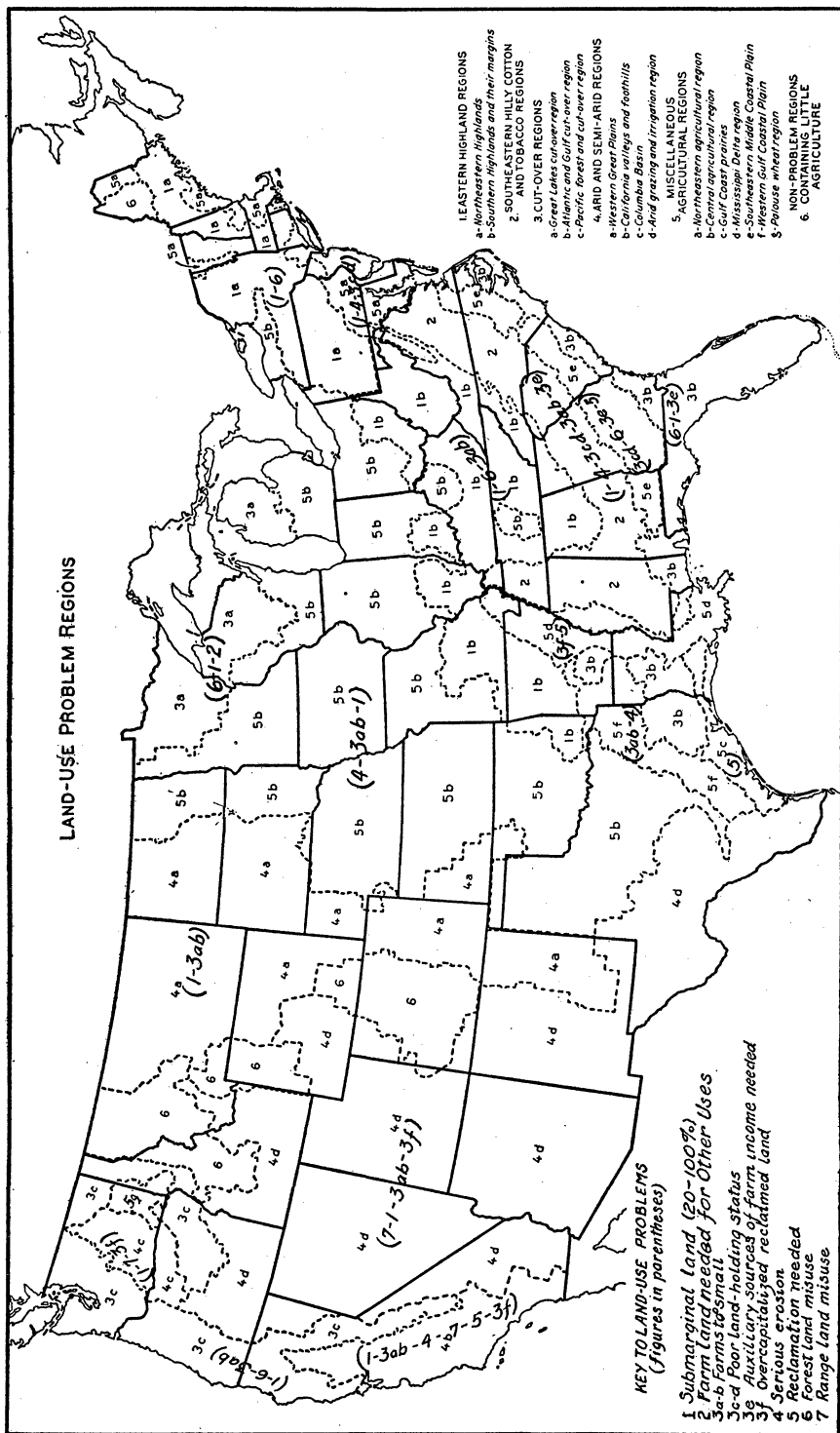


FIG. 2.



regional approach. Indeed, it would seem that any regional boundary may be determined statistically by setting up certain premises for measurement and data breakdown, computing and mapping percentage coefficients by data units, and by drawing boundary lines separating the "spheres of influence" which emanate from the nuclear areas of adjustment.

*Woofter's Indices.* Recently, Professor T. J. Woofter has presented an interesting method of regional determination. Although his definition of the term "region" is open to question, his method of delineation of what he calls "subregions" merits careful examination.

His procedure was to divide tentatively the "South" into unit areas or "socio-economic" entities. This division was accomplished by measurement in terms of fourteen indices of agriculture, manufacturing, trade and population. These varied from "percentage of all land in farms" to "persons per national magazine in circulation" and "per capita value of retail trade."<sup>9</sup> By the aid of these measures, certain regional cores (groups of counties) were determined, separated of course by zones of borderline or transitional counties. The median was calculated for each core in respect to each of the fourteen indices. Then each county in the transitional zone was compared with the cores to see which regional median it most closely resembled. If a borderline county was more like subregion **A** in say eight indices, and more like subregion **B** in six indices, it was thrown with **A**, and so on. This results in the lowest possible statistical variation of counties from the central cores.

*General Indices Needed.* All of these procedures yield systems of regions of very restricted scope. Agricultural regions, land-use maladjustment regions, type-of-farming regions, or socio-economic entity regions, no matter how valid they may be are limited in their usefulness. This must necessarily be the case since they are based upon measurement of data toward specific biased ends.

What is needed is the selection of a system of indices, which when used to measure a large area, will yield coefficients of total human adjustment to fundamen. Not until then will it be possible to delineate by statistical means a system of truly geographic regions—unit areas expressing total ecological relations of man to natural environment.

*National Resources Board, Washington, D. C.,  
February, 1935.*

*John W. Frey.*—It seems to me that this paper raises the questions: "What is the purpose of regional geography? Why bother about regions?"

<sup>9</sup> T. J. Woofter, "Subregions of the Southeast," *Social Forces*, Oct., 1934, pp. 43-50, including a map.

It seems that there are several reasons for going into the problem. It is the cultural background that we as understanding people and students want to get at. We seem to feel it necessary to classify. We can understand better by classifying. Perhaps from the standpoint of background and culture there isn't much reason other than that for attempting classification by regions. That classification, however, is important because we as individuals have a psychological desire to reach out and understand more completely the similarities and the differences of various areas.

Now, there is another reason for attempting classification by regions. That is a very practical one. It may be a matter of solving an economic problem, an administrative problem, a governmental problem. There is some sort of a problem that challenges solution. I shall not attempt to say anything about the values which were established in this study, (*indicating the map, "Indiana Submarginal Land Index."*<sup>10</sup>). I hope they are right; I don't know whether they are or not. It would take considerable time to go over the material to determine to what extent those figures are justified. The point is, however, that without any criticism of the figures themselves, and the way in which they were used to determine values for that land, there was a practical problem that called for classification, and this was the approach to that classification.

Most of you people are interested in education, most of you are teachers now and have been for a long time. I have been away from it now almost long enough to say that I *was* a teacher. And I would like to approach this question of the purpose in regional geography as an outsider, as a person in the government interested in very practical problems in economics, one who is constantly attempting to find out why and what geography can do for the man in business. If you will pardon me, for the benefit of those of you who have not known me long, I will tell you that I started in geology and followed through the usual sequence of topics, geology, physiography, climatology and so on, and then regional geography. Then I had to turn more or less of an economist, and some people today call me an economist. If you call me a regional economist I shall not be insulted, because that to me is a very important phase of geography.

The business man is thinking in terms of regions, but from an economic standpoint. Now, I think there is a grand opportunity for the geographer to contribute a great deal to this coming generation of business men in giving them a regional concept of the world, perhaps painted in rather broad strokes. You can hardly expect the detail of miniatures on ivory when you are trying to paint a world-wide picture. You may have to do it in rather modernistic fashion and use a kalsomine brush. But the oppor-

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<sup>10</sup> Not available for publication.

tunity is there nevertheless to create concepts of regions. Every day I have occasion to use the regional concept. Someone comes into my office and says, "The Planning and Coordination Committee has recommended that commercial deliveries on gasoline should be limited to fifty gallons in Region 5." Region 5 covers this area (*indicating the Rocky Mountain Area on a map of the United States.*) You see we have regions to contend with in the administration of the Petroleum Code. Just as soon as Region 5 comes to my mind, its physiography, its geology, and its climate evolve, expressed in economic terms. For instance, we know that the gasoline consumption in this part of Montana is lower in the winter than the low of summer in Florida, a direct response to a climatic and physiographic situation. The various things that we try to lay hold of as elements in regional geography come right up through the map. We see the road pattern in that area. We know that a man delivering gasoline in Montana is forced to travel long distances. The concentration of population is not such as in metropolitan New York, where the distance traveled by a truck in making its delivery of 800 or 2,000 gallons of gasoline is comparatively small. To make a similar delivery out there in Montana truckers seem to travel endless miles. We see the set-up of the farm, we know how the farmers use the gasoline.

I don't want to bore you any further with my own particular problems, but I do want to leave one idea at least: we who are in governmental work directly connected with economic problems, and those of us that have immediate contact with the business world, know that there are problems of interpretation, and we are reaching out for a concept of them. That concept expresses itself regionally. We can't, somehow or other, make very much use of the so-called "microscopic" geography; it isn't embracing enough in our present economic system. But we can make use of regional geography, and a great deal of it must be economic.

Now to one more point, and that is this question of boundaries. A good many years ago Mr. O. E. Baker taught me the difficulty of establishing transition zones along boundaries. And I have observed it ever since. It is very difficult to fix transition zones especially when one is forced to use rather crude statistics. The extent to which you can interpret regions statistically is of course dependent upon the refinement of your statistics, and obviously there is no use trying to work a problem out into three decimal places when the crude statistics are refined only to the first decimal place. So you are automatically limited by the type of statistics available and the refinement used in the development of those statistics. You can not therefore hope always to draw a sharp line. And what is the difference whether you do or whether you don't? If you get the concept of the area

across, if you give persons who are reaching out for some understanding of a region the concept of that area, that is what we want, that is what the business man wants. I think this is one of the greatest things that those who are making geography their life work can give to the coming generation of people who are engaged in social, economic, commercial, political problems of the nation.

*Lewis F. Thomas.*—In teaching the geography of the St. Louis trade area, which the United States Department of Domestic and Foreign Commerce has outlined arbitrarily by counties, I came across one district (The Missouri Flat Prairies) which has been declining the last few years on account of misuse of certain poor soil areas. In my class I had an assistant sales manager for a packing house. He thought he would try me out, and went down to his books the next day and found that in that area all of their customers and accounts were delinquent. The correlation of geography and business surprised him.

*Malcolm Proudfoot.*—I would like to ask Mr. Renner a question about that map which is entitled "Land-Use Problem Regions" (Fig. 2). Am I right in understanding that that index presented in connection with Indiana (Table 1) was used to determine the submarginality of all the Land-Use Problem regions? From the names given to the regions, I wonder what the nature of the problem was in each specific region. What distinguished one from the other?

*Mr. Renner.*—Those are approximately the indices used in certain cases. I rather suspect that some of the States slacked off on the job and did subjective pieces of measuring rather than the type of objective relative measuring that some other States used. But keyed on that map, Mr. Proudfoot, are the problems—in pretty small lettering to be sure—according to the familiar classification figures that the Land Policy Section of the A. A. A. used. Are you familiar with that?

*Mr. Proudfoot.*—No, I am not, and I was wondering if you could pick one region there and tell us what the problem is.

*Mr. Renner.*—I think I can. This area (*pointing to map*, Fig. 2) I suppose one would call the Western Great Plains. It has three outstanding problems, that is, the area is characterized by a combination of those three things. In some cases, those problems occur in large blocks, in other cases, an interrelated pattern of the A. A. A. designations 1, 3ab, and 4. 1 is submarginal land which should be withdrawn, because it is uneconomic for further cultivation or further use. 3ab, is the necessity for enlarging farms, either for providing more adequate farm practices to cope with erosion, or to enlarge the income of the farmer. And 4 is the erosion

problem. (In this case, it was primarily wind erosion.) To summarize, the combination of problems is submarginal land, necessity for farm enlargement, and wind erosion.

*Mr. Proudfoot.*—The only specific thing I can see there is the need for larger farms. Now, when you say submarginal land, how much submarginal land, what is the nature of the submarginal land? Similarly, when you speak of wind erosion, how much area is suffering from wind erosion? Is that known quantitatively for each one of those regions?

*Mr. Renner.*—Fairly well, but I think I can more fairly answer that by referring you to Mr. Barnes, who I believe originated that index. Mr. Barnes, could you answer that?

*Carleton P. Barnes.*—It might be well to call attention to the fact that these are very large regions, within which there is a variety of land-use problems. Each one of these large regions has a characteristic pattern of problems. There may be five or six different ones. Not all the land in any of these regions falls into the problem category, but more or less regularly repeated over each region you do find characteristic problems—they form patterns of problems differing from region to region. For example, in the grazing country of the Southwest, you have a set of problems considerably different from that in the Southeast. The magnitude of the problem may also differ greatly.

That set of indices, Mr. Renner—wasn't that used only in Indiana, and only for the poor land problem where retirement was advocated?

*Mr. Renner.*—Yes, I think I stated that in my paper, but I presented it as a model.

*Mr. Barnes.*—No other State used that?

*Mr. Renner.*—In one case, the land consultant apparently didn't use any criteria. That was in Nevada. We had to run a machine card count of division of income. From this we got the low income figures and pulled out certain data and made certain deductions.

*Mr. Barnes.*—There are problem area maps that show the distribution of these different kinds of problems in much greater local detail than that map does.

*Mr. Proudfoot.*—I realize that map is highly generalized, but I wonder if it states in a quantitative way the kind of problem and really how much of that kind of problem there is.

*Mr. Barnes.*—There are quantitative *estimates* with respect to certain types of problems.

*Mr. Proudfoot.*—That is the best one could get, I imagine.

*Mr. Barnes.*—We do find each combination of problems repeated more or less over large regions.

*Mr. Renner.*—May I say further, Mr. Proudfoot, that the map of which this is a generalization is a very large map of very intricate details, drawn by Mr. Marschner, the cartographer of the Bureau of Agricultural Economics. It is probably the most amazing map of its kind that has ever been prepared. But this map here is only, as Mr. Barnes points out, an attempt to regionalize the data.

*C. F. Marbut.*—Mr. Renner, you have defined your problem areas by the statistical method. Now what are you going to do about it? What are you going to do next? I am really in earnest. You have defined certain areas by the statistical method. Now, what is the next step?

*Mr. Renner.*—You mean, what is going to be done with this map?

*Mr. Marbut.*—Yes.

*Mr. Renner.*—Well, that map went into the report which was delivered to President Roosevelt last month,<sup>11</sup> and if he cuts us off nothing will be done. If he says "O. K." . . .

*Mr. Marbut.*—Well, what I want you to answer is, "The next thing is to recommend the adjustments that are necessary?" Then the next question I have is, "Are you going to recommend the adjustments on the statistical basis?"

*Mr. Renner.*—Undoubtedly, yes. There would be very careful field studies.

*Mr. Marbut.*—How are you going to get at the quality of the climate, the quality of the soil, the quality of the relief, on the statistical basis? The adjustment must be based on the nature of the country.

*Mr. Renner.*—I am afraid our minds are working at cross-purposes.

*Mr. Marbut.*—Well, you have defined your problem there on the basis of statistics. The next thing to do it to adjust those problems. Now, how are you going to make recommendations for the adjustment of those problems by statistics? That is what I mean.

*Mr. Renner.*—That isn't my province, but it is the province of about three hundred different men, each of which will be given one particular problem.

*Mr. Marbut.*—But they will do it by statistics?

*Mr. Renner.*—They will be handled in probably three hundred different ways. There will be certain men on farm management, certain men on soil erosion, certain men on subsistence homesteads, certain men in various other agencies, and organizations that will be set up to handle specific problems. But that gets over into the question of what can be done to remodel man's adjustment to the whole fundamental set-up in this country, and what will be the future of that, certainly I don't know.

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<sup>11</sup> National Resources Board: *Report on National Planning, December 1, 1934.* Washington: 1934.

*Mr. Marbut.*—I merely wanted to bring out the fact that after you use your statistical method to point out your problem areas, then you have to use another method in order to solve the problems.

*Mr. Renner.*—Not necessarily. The A. A. A. organization has perhaps a couple of hundred statistical clerks who think they probably could apply them statistically. We have three rooms of people who are equipped to handle any statistical problems, including machine tabulation.

*Mr. Barnes.*—I am afraid we are inclined to overemphasize a bit the amount to which the statistical approach was used in determining those regions. In large measure the determination of those problem areas was subjective, I think, although in each case the man who did the work had certain criteria to go on. Nevertheless, he made his own interpretation of those criteria and also gave us the best judgment of people who were qualified to have judgment in the respective States. In answer to your question about whether recommendations for these adjustments are to be made quantitatively, I should say in only the case of one type of adjustment has there been any quantitative recommendation made in the report. That is made very guardedly, and it provides that the adjustment would take place over a considerable period of time, and as it becomes expedient.

*Mr. Renner.*—I think probably part of the trouble, Mr. Marbut, arises from your use of the term "statistical." I have adhered to the definition that was handed me along with my assignment, *i.e.*, statistical not in the narrow mathematical sense, but involving the use of all descriptive data.

*O. E. Baker.*—I want to express a personal hope that the method adopted will be that of using the data provided by the soil survey, climatic studies, population studies, and others; but if the work advances at the rate of \$75,000,000, or even \$25,000,000 a year, I am afraid time will not permit such careful consideration as Mr. Marbut has indicated is desirable.

*Mr. Barnes.*—You will find, Mr. Marbut, that the men who gave us this judgment made a rather complete use of the soil survey.

*Mr. Marbut.*—I wasn't thinking of the soil survey, I was trying to bring out the fact you can't use figures in order to solve the climatic, relief, and other problems.

*Wallace W. Atwood.*—Would it be fair to ask what practical good that Land-Use Problems map would be, then, to you in your work?

*Mr. Renner.*—I wouldn't want to extol the virtues of the map, but I can tell you what it was used for. We were asked to prepare a large section in the Report to the President dealing with those social and economic characteristics of the United States which indicate a need for land readjustment. In order to do that, it seemed almost imperative to have regional units to present our data from, and the most valid regions, the most valid system

of regions, would seem to be those which grew out of the grouping of the very problems which the social and economic distress were measures of. Hence the method of grouping these things together to get a system of regions and then presenting economic and social data which would indicate need for immediate planning as applied to these areas.

*Mr. Marbut.*—That map is a localization of your problem?

*Mr. Renner.*—Yes, in a broad way.

*Mr. Baker.*—May I suggest that that map is primarily to present the picture, in order to help members of Congress and others to visualize the situation.

*Richard Hartshorne.*—Perhaps we are not here to solve the national planning problem of the United States, but to consider the problem of geographers studying regions—in this particular case a statistical approach to regions. Apparently this map of Land-Use Problems has been made on a non-statistical basis, or if it is on a statistical basis we don't know just what that statistical basis is. I should like to know if the other map, Types of Farming Areas in the United States (Fig. 1), is not on a strictly mathematical, statistical basis?

*Mr. Renner.*—Yes, I presented those two maps as more or less contrasting. The 812 districts or type-of-farming areas were determined by machine tabulation throughout, although I suppose the element of judgment did enter into the final laying out of boundaries and polishing off corners of regions. This map was part of a long-time program, done for a variety of reasons. The map of Land-Use Problems exemplifies a much coarser approach to solve a problem arising in a crisis.

*Mr. Barnes.*—It is my understanding that the map of Types-of-Farming Areas is based primarily on statistics of the percentage of farm income derived from different enterprises.

*Mr. Renner.*—They had between 300 and 400 of the census clerks working on them for a good many weeks and months.